

and the solar radiation as measured by actinometers. The building for the work in seismology will be entirely subterranean. The habitual purity of the sky, the entire absence of electric tramways, and of whatever may produce magnetic perturbations render this a favorable location. The observatory is in the neighborhood of the principal college of the Jesuits, namely, the college of higher studies, so that those who expect to be sent to the Observatory at Manila will receive preparatory education in observatory work. Fortunately, this observatory is also in the belt of totality for the eclipse of 1905, and it is hoped that everything will be in readiness for special work on that occasion.

In 1902 an important observatory for astronomy, geodynamics, and meteorology was established by the Society of Jesuits in Grenada, Spain, and its first annual volume of monthly bulletins for the year 1903 has been published. A still older seismologic station is a part of the marine observatory located at San Fernando, near Cadiz, Spain, and represents the high table-land of that region. At this station a Milne pendulum is established, whereas at the Ebro Observatory there is at present a microseismograph by Vicentini, and a horizontal pendulum by Grablovitz.

In so far as observatories for seismology, earth currents, solar phenomena, magnetism, tides, or astronomy maintain also records and studies bearing upon meteorology, we must welcome their indefinite multiplication. As yet we have but a fragmentary knowledge of the earth's atmosphere, and although it seems like accumulating an unmanageable mass of details, yet eventually all will be coordinated properly. The present state of astronomy is the result of just such a similar accumulation of details; crude records that are two thousand years old have been combined with those that are two hundred years old, and even with the most accurate work of the present day, in order to perfect our knowledge of the movements of the heavenly bodies. Just so it will be in meteorology. The data as to storms, the pressures, temperatures, and winds that have been recorded during the past fifty years will be combined with the more complete data and weather maps of the whole world that will be available to our successors, in order that they may understand more perfectly than we the movements that appear to us so irregular and accidental.

#### A NEW MOUNTAIN OBSERVATORY.

By the joint efforts of the Italian Alpenverein, the Duke of Abruzzi, the Minister of Agriculture for Italy, and Queen Margherita, a geophysical observatory on the summit of Mont Rosa, at an altitude of 4560 meters (14,961 feet), has at last been erected. It is the highest in Europe except that of Vallot on Mont Blanc, and higher than the station on Pikes Peak formerly occupied by the Weather Bureau. The regular observational activity will begin in the summer of 1904. Young men expert in meteorological and physical laboratory work will be appointed as assistants. It will be occupied in the winter time as well as in the summer if the severity of the weather does not prevent. Both the observatory and the hut of refuge for mountaineers will be accessible, not only to Italian but to foreign students who wish to carry on geophysical investigations therein. In fact, it was used for that purpose last summer. The meteorological observations are expected to be of especial importance in connection with the simultaneous international balloon ascensions. Italy now possesses three mountain observatories, namely, Mont Rosa, 4560 meters; *Ætna*, 2942 meters; Cimone, 2162 meters.

#### KITE ASCENSIONS AT KAZAN.

During the summer and autumn of 1893 a Richard meteorograph was sent up to considerable heights at the University

of Kazan by Prof. V. A. Uljanin, professor of physics and director of the meteorological observatory. The Hargrave kites were used, with surfaces of about two to three meters square. The meteorograph was carried either between two small kites or by one large kite. The first four ascensions gave the following general average temperature gradient per 100 meters altitude:

1903, July 18, 1.23° C., up to 858 meters.

1903, September 1, 0.88° C., up to 635 meters.

1903, September 5, 1.08° C., up to 1270 meters.

1903, October 1, 0.85° C., up to 766 meters.

#### POLARIZATION OF THE LIGHT OF THE SKY.

The observation of the polarization of sky light is a matter that has interested meteorologists ever since the early work by Arago, Babinet, and Brewster; it seemed to promise to give us some information with regard to the moisture, the dust, the mixture of warm and cold air, and even, according to the latest studies, the nature of the gases that are mechanically mixed together in the atmosphere. The latest contribution to this subject is published in the *Meteorologische Zeitschrift* for March, 1904, namely a series of observations on the polarization of sky light made by Dr. G. Sack in Lubeck. These are a continuation of the studies made by Dr. Busch in 1886-1889, which latter were stimulated by the optical effects produced by the volcanic eruption of Krakatoa in 1883. The work of Dr. Sack began as soon as he heard of the eruptions of Mount Pelée, Martinique, and Soufriere on St. Lucia, in the summer of 1902. He determined the neutral points of Babinet and Arago by means of a Savart polariscope. The observations extend from September, 1902, to the end of August, 1903, and the following general conclusions are announced by Dr. Sack:

1. The distances of Babinet's point from the sun and of Arago's from the antisun change in the same direction with the position of the sun at the time of its rising and setting.

2. The general law announced by Dr. Busch (*Meteorologische Zeitschrift*, December, 1886), can be expressed more generally as follows:

The distance of the Babinet point from the sun increases until the sun is at a slight altitude above the horizon, when it has its maximum value, and decreases as the sun departs from this position; the distance of the Arago point from the antisolar point decreases until the sun attains a slight altitude below the horizon, when it has its minimum value, and increases as the sun departs from this position.

3. The effect of the eruption of the West Indian volcanoes is recognized by an astonishing increase in the distance of the Babinet point from the sun and a decrease of the distance of the Arago point from the antisun.

It will be remembered that in 1892 the Weather Bureau had an opportunity to employ one of our most distinguished American physicists, Prof. Carl Barus, now at Brown University, upon various problems in meteorology, especially the method and process of condensation of aqueous vapor in the atmosphere. A preliminary notice of his work was published in a report of the Chief of Bureau, 1891-2, pp. 526-8. His first results were published in the *Weather Bureau Bulletin*, No. 12, "Report on the Condensation of Atmospheric Moisture," by Carl Barus, Washington, 1895. The dates of the preface are May 1, 1893, and April, 1895, and the report presents the results of much work done after the position occupied by Dr. Barus had been abolished by Secretary Morton; he having been able to continue his work at his own expense, with some considerable assistance from Prof. Alexander Graham Bell. *Bulletin* No. 12, presenting the results obtained up to 1895, has been followed by a series of equally interesting and important papers published either in the *London*, *Edinburgh*, and *Dublin Philosophical Magazine*, or in the *Contributions of the Smithsonian Institution*. The latest results of this research, which is still being actively prosecuted, were communicated to the Ameri-

can Physical Society at its meeting on February 27, 1904. The following is quoted from Science, April 1, as a summary of that paper, "On the microphotography of fog particles and the photographic study of atmospheric nucleation."

The author gave a description of his apparatus and methods, and illustrated the results by a series of ten lantern slides and many positives showing the microphotographs of fog particles. Most of these were strikingly distinct, the water globules ranging in size from about 0.0002 centimeters to 0.002 centimeters, according as fogs of different degrees of fineness were precipitated. The most highly graded nuclei, as shown by the presence of fog particles of all sizes, were obtained by an exposure of dust free air to the X rays from one to ten minutes, depending on the intensity of radiation. Much greater uniformity in the series of the nuclei is shown in the cases of phosphorus and ordinary air nuclei.

The author described a number of curious phenomena observed with these water particles, among which their continued motion when caught on a film of liquid oil, simultaneously to and fro between edges of the film, is most noteworthy. Particles moving in swarms in opposed directions are often in the focus of the microscope together, and thus lie very nearly in the same plane. The author finally remarked that the coronal method had now been so far perfected that the nucleation increment produced by a single gas flame in a moderately large lecture room could be detected in about ten minutes, even in the air collected from near the floor. This favorable quantitative result may then be supplemented qualitatively by the photographic method, which will show the presence of exceptionally small or large particles, whose effect vanishes from the corona as they are relatively few in number.

#### THE WINTER OF 1903-4 AT THOMPSON, WINDHAM COUNTY, CONN.

It is well known that one of the longest temperature records in New England is that kept by Miss Ellen D. Larned for over fifty years at Thompson, Windham County, Conn. A short note from her states that the past winter has been the coldest within the last half century. "We have been less afflicted with high winds and severe snowstorms than in some sections, but had excellent sleighing from December 30 to March 3." The following is the temperature record:

December, 1903, mean .....	23.4°
January, 1904, mean .....	17.9°
February, 1904, mean .....	18.6°
Mean .....	20.0°

During the years 1852-1904, the coldest December was in 1872, mean temperature, 20.6°; the coldest January was in 1857, mean, 10.8°; and the coldest February was in 1901, mean, 18.1°. Although the general average of the present winter is the lowest on record, yet the individual months have been exceeded.

Other cold winters, according to Miss Larned's records, are as follows:

1856-57, mean .....	22.3°
1867-68, mean .....	21.4°
1872-73, mean .....	22.5°
1874-75, mean .....	22.0°
1892-93, mean .....	20.7°

The warmest winter was 1889-90, mean, 31.7°.

#### LOCAL STORM AT PORTLAND, OREG.

Mr. E. A. Beals, District Forecaster at Portland, Oreg., describes a windstorm, or incipient tornado, which passed through the eastern portion of that city on February 26. A low pressure area was central that morning off the northwest Washington coast. Therefore Portland was in the southeast quadrant of the cyclonic disturbance and about 400 miles from its center.

At 10:42 a. m., local time, a very black, low cloud was observed at the station, passing rapidly toward the east-northeast. The barometer rose suddenly .04 of an inch and then fell rapidly to the starting point. Wind and temperature, also, fluctuated rapidly, and heavy hail fell for about three minutes.

The greatest destruction occurred about 4 miles from the station, in what is known as Barretts Addition, where two houses were destroyed and others damaged. While the dis-

tribution of the debris did not positively indicate gyratory winds, the force exerted appeared to be greater than is probable in a straight line blow. The houses destroyed were not very substantially built. The trees prostrated varied in diameter from 3 inches to 1 foot. They were all coniferæ with bushy tops. Those that were broken off were small in size and where broken gave no indication of being subjected to a twisting force. The storm came from the west-southwest and moved toward the east-northeast. The tops of the trees to the right of the center of the storm track pointed a trifle to the east of north, and those to the left of the center pointed a trifle to the west of north.

Witnesses describe the cloud as very black and close to the ground; some of them noticed a single flash of lightning, but only one observed any whirling motion or funnel shape. They agree that the rain was very light before the storm, but quite heavy for about fifteen minutes after it had passed. Heavy hail began to fall just before the wind struck the buildings. It was oval in shape and about the size of marbles. One person saw two clouds, which approached each other from the northwest and southwest, and, after meeting, seemed to roll down almost to the ground and then move rapidly toward the northeast.

The width of the path of destruction was 200 feet and the length nearly ten miles. In the center of its path there were houses as well as trees that escaped injury, and the people living in them did not notice that the storm was uncommonly severe. There were no lives lost, but several people were slightly wounded. The damage to property amounted to about \$5000.

#### BRIGHT METEOR OF SEPTEMBER 15, 1902.

Mr. E. L. Mosely, of Sandusky, Ohio, has made a special study of a remarkable meteor that passed northward over eastern Ohio about 5.42 a. m., September 15, 1902, and was seen by observers in Michigan, Ontario, Indiana, Pennsylvania, New York, and West Virginia. He desires as many additional records as possible. Will not all who read this paragraph kindly examine their old records, diaries and memoranda, scrap books, and local newspapers, and send Mr. Mosely whatever they find bearing on this meteor? The mere fact that it was seen or heard will be of value. Many times, when the sky is covered with clouds, the observer merely hears a great noise, like an explosion, and knows not the origin of the noise. Sometimes it is attributed to an earthquake; at other times to the blowing up of a distant powder mill or steam boiler; sometimes the windows rattle and it is spoken of as an earthquake. Whatever happened on the morning of September 15, 1902, over a region between western North Carolina and upper Michigan and Ontario, should be examined with reference to its possible connection with this meteor. To very distant observers it may have seemed merely like a bright shooting star.

#### HYPOTHESES AS TO THE CAUSE OF THE AURORA BOREALIS.

In the Bulletin of the French Society of Physics for 1903, pp. 184-220, Mr. Charles Nordmann, an employee of the Astronomical Observatory at Nice, reprints a thesis lately presented by him to the faculty of sciences at Paris. He develops arguments in favor of the hypothesis that the aurora, as observed on the earth, is the result of Hertzian waves that emanate from the sun, and that are registered regularly at the magnetic observatories, just as the ordinary electrical phenomena of the atmosphere are recorded at other observatories. He has tried to prove logically that the sun sends out such Hertzian waves of greater intensity from the regions, and at the epochs, of the greatest solar activity; that is to say, from the regions of spots and faculae and at the moments of the maxima of solar spots. He finds that the form and orientation of the detailed struc-